|  |  |  |
| --- | --- | --- |
| Input variable | Description | Default or typical value |
|  | METEO INPUT |  |
| nobs ptq | Number of obs read in for pressure (mb), temperature (degrees C), temperature dew point difference (degrees C); pressures converted to heights. | 12 |
| nobs wind | Number of obs read in for wind speed (kt) and direction (degrees of compass: N = 360 degrees) | 11 |
| Omega (cm) | Precipitable water for sounding; calc. solar transmission | 3.12 |
| Zo (m) | Roughness parameter | .05 |
| Obst\_hgt (m) | Obstacle height; used for computer duel roughness regimes as when scattered trees are surrounded by grass | 1 |
| Cloud flag | Allows for attenuation of solar flux by cloud, if true | True/false |
| Cloud fraction | Fraction of cloud cover in decimal; temporarily set to 0.0 | 0 |
|  | SOIL AND GROUND INPUT |  |
| F | Surface soil moisture availability (fraction of field capy.) | 0.5 (0 – 1.0) |
| fsub | Substrate soil moisture availability ( recommended not to be set below 0.1; model will crash if set to zero) | 0.75 (0.1 – 1.0) |
| wmax | Calculated: set equal to 0.75\*thmax in soil table | 0.34 |
| btemp | Deep layer ground temperature, degree C; (does not vary during simulation)  It should be set on the location’s monthly average temperature or from climatology  Note: temperatures in substrate are calculated from the diffusion equation, wherein the conductivity and diffusivity are determined by regression from the thermal inertia. Dummy substrate vertical intervals are assigned the non-dimensional values of 1. | 24.6 |
| TP | Thermal inertia; may be calculated from F (**PSOIL**) if logical Y is read in. Otherwise, it is specified. If Y then parameters a and b are read in as specified below. Below are various suggestions for the form of TP, calculated in mks units:  **TP = Tia\*F +\_Tib**  ***c TP*** = ***F*** \* 0.04000 + 0.02000 ! Toby's Generic Soil  c ***TP*** = ***F*** \* 0.03000 + 0.03400 ! Toby's FIFE Soil  c ***TP*** = ***F*** \* 0.04600 + 0.01400 ! Price's Sand  C ***TP*** = ***F*** \* 0.03890 + 0.01290 ! Price's Clay  c ***TP*** = ***F*** \* 0.04241 + 0.01349 ! Price's AVG(Sand,Clay)  C ***TP*** = ***F*** \* 0.03000 + 0.00690 ! Price's Peat  c ***TP*** = ***F*** \* 0.04600 + 0.04500 ! Walnut Gultch  User should choose the appropriate a and b parameters; otherwise adopt read in value. To convert to TI units (e.g., 12) multiply by 356.89  **Thermal inertia defined as soil thermal conductivity times the soil thermal diffusivity, the latter taken to the minus one-half power. (These two parameters are calculated uniquely from TP)** | 13 |
| Dual\_ti | Yes/no function whether to calculate TP (yes) or specify | Y (typical value for TI, if no indicated (12) |
| Tia; Tib | Regression equation constants for TP (=Tia\*F +Tib) | Tia = 0,.04; Tib = 0.02 |
| Albg | Ground albedo, enter value as decimal, zero to be calculated (from surface wetness parameter, F, and a non-zero value if not to be calculated | Typically 0.05 – 0.4 |
| Epsi | Surface emissivity | 0.96 |
| Index\_soils | Reads in Cosby soil types, one of 11 in table  Cosby soil types; (Cosby et al, 1984: WRR, p 682); used in calculating ground water potential; see Carlson and Lynn (1990; equation 2)  =========================================  **Soil type rks cosbyb thmax psis**  'Clay\_loam'     0.347   8.17    0.465   4.14  'Light\_clay'    0.138   11.55   0.468   5.31  'Loam'  0.479   5.25    0.439   4.71  'Loamy\_sand'   1.995   4.26    0.421   1.75  'Sand'   6.607   2.79    0.339   2.32  'Sandy\_clay'    1.023   10.73   0.406   2.69  'Sandy\_clay\_loam     0.631   6.77    0.404   3.1  'Sandy\_loam'    0.74    4.47    0.434   3.16  'Silty\_clay'     0.191   10.39   0.468   4.53  'Silty\_clay\_loam'   0.288   8.72    0.474   5.99  'Silty\_loam'    0.398   5.33    0.43    6.55 | 1 (clay/loam) |
|  | **TIME, LOCATION, SLOPE PARAMETERS**  **Note: time increment of 90 seconds is set internally**  **Values used are arbitrary numbers from a previous simulation** |  |
| Year | Year (not used in computations) | 89 (1989) |
| Month | Month of year | 8 (August) |
| Day | Day of month | 4 |
| Tz | Time zone from Greenwich; 5=eastern standard time | 6(Midwest) |
| Xlat | Latitude –decimal; positive northern hemisphere | 39.25 |
| Xlong | Longitude- decimal; positive west of Greenwich | 96.34 |
| Strtim | Starting time of model in 24 hour clock | 0530 |
| Timend | End time of model (do not run pas 2330) | 2330 |
| outtt | Output interval in minutes | 30 |
| Slope | Slope of terrain (degrees – converted to radians) | 0 |
| Aspect | Aspect (degrees); positive facing east? | 0 |
| Station height | Height of ground point in question (m) | 0.886 |
| Geostrophic winds | Calculated internally assuming initial wind velocities at 1050 m an above are geostrophic and wind velocities below are equal to that at 1050m |  |
|  | **VEGETATION PARAMETERS (read (9,\*)** |  |
| Frveg | Fraction vegetation cover; 0 = bare soil, **expressed as a percent** | 0-100 |
| Xlai | Leaf area index; 0 = no vegetation; never use below LAI=2 | 2-10 |
| Epsf | Vegetation emissivity | 0.96 |
| Albf | Albedo of foliage. Enter value as decimal; zero if to be calculated (from solar angle) | Typical value 0.05- 0.2 |
| stmtype | Stomatal resistance formulation: L = Lynn and Carlson –recommended (1990: Ag and Forest Meteor.)  D = Deardorff formulation; B = Ball-Berry (Kell Wilson) | L |
| Index\_veggies | Choose type of vegetation in numbered list; (see below)  As of now (end of 2019) only **five** categories have been defined on the basis of previous simulations | 4 (corn) |
| volrel | Parameter used in plant storage module (capac.for)  Recommend skip unless familiar with the formulation described in Carlson and Lynn (1991; Ag and Forest Meteor.) | .1 |
| Rmin | Minimum stomatal resistance; inherent in plant, it delimits the minimum possible stomatal resistance during the day | 25 - 50 s/m row crops; generally 25-300 s/m |
| Rcut | Leaf cuticle resistance; inherent in plant | 1000 s/m |
| wilt | Wilting point in relative volume of water in soil  Dearforff stomatal formulation | 0.08 |
| Vegheight | Height of vegetation | 0.5 m |
| width | Width of leaf | 0.12 m |
| steady | Decides whether capacitance module used; Y= no capacitance; yes calls capacitance module recommend latter module not be used | Y |
| Ci; co | Internal (leaf) and external (air) CO2 concentrations, respectively (ppmv). Note, current concentration >410 | Ci=300  Co = 330  (now 410 ppmv) |
| Coz\_sfc; coz\_air | Ozone (O3) concentrations at the ground and in the air  ppmv | 0,  0.08 |
|  | **MORE VEGATATION PARAMETERS (read (1,\*))**  **Values for specific plants limited to only five species that are based on previous experience and simulations. User is free to add categories** |  |
| Planttype | Chooses which plant type one wishes to use  See table with plant types listed | 1 – 5  Corn (row 4) |
| Mintemp; maxtemp | Minimum and maximum temperatures over which plant can survive. Vegetation model inoperable beyond limits | 0; 50 C |
| Beta | Increases stomatal resistance due to vapor pressure difference (plant-atmosphere); operates in certain types of plants such as soybeans, trees units of leaf water potential per vapor pressure deficit; thus,  Psim= psie+ beta\*vf12 (vapor pressure deficit in plants)  May cause transpiration reduction in dry climates by allowing plant to reach critical water potential sooner or more easily | 0  (range 0 -0.05) |
| b1, b2 | Slope of epidermal stomatal resistance as a function of epidermal leaf water potential below and above leaf water potential threshold; negative means increasing resistance with decreasing water potential; units of stomatal resistance per unit of leaf water potential | Almost zero; larger than 1.0 |
| Psie | Critical leaf water potential; bars; figures in stomatal resistance function rs as psiem (see stomrs.for) | Typically -8 to -20 bar |
| Sc | Critical solar flux, below which stomatal resistance increases rapidly with decreasing solar flux; units s/m per Wm-2. In stomatal resistance function fs (see paper by Olioso et al, AG and Forest Meteo., 1996) | Typically 100-400 |
| Rcut | Cuticle leaf resistance; s/m | Typically 1000 |
| Zp | Hydraulic Stem resistance; units s\*\*2 | 0.03-0.1 |
|  | **PLANT CAPACITANCE PARAMETERS**  Should not be change unless one is intimately familiar with capacitance papery by Carlson and Lynn (1991) | SEE CAPAC.FOR |
|  | FRHGT; FRZP RKOCAP RCCAP; RZCAP; VOLINI; ZSTINI  0.5; 0.5; 50; 1; 4; 0.01; 0.01 |  |
|  | **WINDS AND TEMPERATURE INPUT**  **GEOSTROPHIC WINDS** |  |
|  | **PRESSURE (MB), TEMPERATURE (C), TEMPERATURE-DEWPOINT DIFFERENCE (C), WIND SPEED AND DIRECTION; WIND LEVELS**  **Interpolated to model levels 50, 300, 550, 800 m…….** |  |
| Station Height | **Altitude of simulation location above MSL** | M |
| Nobs\_pTq | Number of observations for temperature and dewpoint | Typically 12 |
| Read 1 to nobs\_ptq | Pressure, temperature; temperature dewpoint depression; typically 12 levels up to about 250 mb; must not exceed 12300 m | Degrees C |
| Nobs\_wind | Number of observations for wind speed and direction | Typically 10 |
| Read 1 to nobs\_wind | Wind direction (def: from the north = 360 degrees), wind speed (kt; as reported); zh (feet) |  |
| Ntrp | Number of computational levels in the model, 50, 300, 550, 800, …….about 12300 m. | Not read  (calculated) |

TABLE **OF PLANT VARIABLES, EXCLUDING THOSE SPECIFIC FOR CAPACITANCE**

**(Capacitance data are all identical numbers from one plant to another and these are contained in another table)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | planttype | rmin | mintemp | maxtemp | beta | B1 | B2 | psice | sc | rcut | zp |
| 1 | soybean | 50 | 0 | 50 | 0.062 | -2E-6 | 10 | E-14 | 350 | E5 | 0,06 |
| 2 | Mixed forest | 200 | 0 | 50 | 0.03 | -5E-7 | 1.25 | E-16 | 400 | 5E5 | 0.035 |
| 3 | cotten | 50 | 0 | 50 | 0 | -E4 | 500 | E-16 | 450 | E3 | 0.05 |
| 4 | corn | 50 | 0 | 50 | 0 | -2E-5 | 3 | E-16 | 450 | E3 | 0.05 |
| 5 | Alfalfa | 125 | 0 | 50 | 0.02 | -8E-5 | 500 | E-13 | 50 | 5E3 | 0.028 |
| 6 | C3 grasses | 25 | 0 | 50 | 0 | -4E-6 | 20 | E-18 | 50 | 5E3 | 0.04 |